

ABSTRACT

The present invention provides a MEM system (10) having a platform (14) that is both elevatable from the substrate (12) on which it is fabricated and tiltable with one, two or more degrees of freedom with respect to the substrate (12). In one embodiment, the MEM system (10) includes the platform (14), a pair of A-frame structures (40), and two pairs of actuators (30) formed on the substrate (12). Ends (46A) of rigid members (46) extending from apexes (40A) of the A-frame structures (40) are attached to the platform (14) by compliant members (48A, 48B). The platform (14) is also attached to the substrate (12) by a compliant member (48C). The A-frame structures (40) are separately pivotable about bases (40B) thereof. Each pair of actuators (30) is coupled through a yoke (32) and displacement multiplier (34) to one of the A-frame structures (40) and is separately operable to effect pivoting of the A-frame structures (40) with respect to the substrate (12) by equal or unequal angular amounts. Upon pivoting, the A-frame structures (40) act as lever arms to both lift the platform (14) and tilt the platform (14) with respect to the substrate (12) with at least one degree of freedom. Since the platform (14) lifts up from the surface of the substrate (12), it may be tilted at large angles with respect to the substrate (12).